Measuring (socio-)economic systems using the SNA. A SAM approach.

Santos, Susana
ISEG (School of Economics and Management), UTL (Technical University of Lisbon), UECE – Research Unit on Complexity and Economics, DE – Department of Economics

12. August 2011

Measuring (socio-)economic systems using the SNA. A SAM approach.

Susana Santos*

ISEG (School of Economics and Management)/UTL (Technical University of Lisbon); UECE – Research Unit on Complexity and Economics and DE – Department of Economics

Abstract

A SAM (Social Accounting Matrix) can be an important tool for measuring a society's activity, underlying which there are systems that can be worked upon in different ways. This tool will be presented as an alternative support for those who intervene in the policymaking process, which can be directed towards different parts of those systems.

Both numerical and algebraic versions of the SAM will be referred to, while the method to be used in constructing the former from the System of National Accounts (SNA), implemented by the United Nations, will be examined. The SAM's basic structure and consistency within the whole system will be studied, as well as any possible disaggregations, extensions, aggregates, indicators and balances that can be calculated. Other aspects beyond that basic structure will also be examined.

Key words: Social Accounting Matrix; National Accounts;

JEL classification: C82; E01; E61

(*August 2011*)

* Rua Miguel Lupi, 20, 1249-078 Lisboa, Portugal (*ssantos@iseg.utl.pt*).

The financial support provided by FCT (*Fundação para a Ciência e a Tecnologia*) in Portugal is gratefully acknowledged. This paper is part of the Multi-Annual Funding Project (POCI/U0436/2006).

Contents

1. Introduction 1

2. The SAM-based approach 1

3. Constructing numerical versions of SAMs from the SNA. An application to Portugal 3

3.1. The SAM's basic structure and its consistency with the whole system 4

3.2. Disaggregations and extensions 12

3.2.1.Production and trade accounts 12

3.2.2.Institutions and Rest of the World accounts 13

3.3. Aggregates, indicators and balances 16

3.4. Examples of policy-type questions that can be addressed using SAMs 21

4. Going beyond the basic structure 25

5. Concluding remarks 26

References 27

1. Introduction

In this paper, the Social Accounting Matrix (SAM) will be presented as a tool for measuring a society's activity, underlying which there are systems that can be worked upon in different ways. Thus, the SAM will be presented as an alternative support for those who intervene in the policy decision process, which can be directed towards different parts of those systems.

Adopting a conceptual framework based on the works of Graham Pyatt and his associates, Section 2 specifies the main features of the SAM-based approach, according to which the SAM can describe a society's activity either empirically or theoretically, depending on whether it is presented in a numerical or an algebraic version, respectively.

Accompanied by an application to Portugal, Section 3 provides some methodological details regarding the construction of numerical versions of SAMs, adopting the national accounts based on the United Nations System of National Accounts (SNA) as the base source of information. Different possibilities of analysis, provided by aggregates, indicators and balances that can be calculated from such versions, will precede two examples of policy-type questions that can be addressed using the same tool.

Section 4 examines certain aspects that lie outside the basic structure, which were presented in the previous section.

The concluding remarks, presented in Section 5, systematise the main ideas of the other sections in order to show that, since countries have national accounts based on the SNA, they can use SAMs to approach (socio-)economic systems and support policy decision processes.

2. The SAM-based approach

Richard Stone and Graham Pyatt played a key role in the implementation of the SAM-based approach. Both worked on the conceptual details of that approach: the former worked more in numerical terms, within the framework of a system of national accounts, while the latter worked more in algebraic terms, mainly within the scope of input-output analysis. Their work has been decisive for understanding the importance of the SAM as a measurement tool.

In the foreword to the book that can now be regarded as a pioneering work in terms of the SAM-based approach, "Social Accounting for Development Planning with special reference to Sri Lanka", Richard Stone stated that the framework of the system of national accounts can be rearranged and "the entries in a set of accounts can be presented in a matrix in which, by convention (…), incomings are shown in the rows and outgoings are shown in the columns; and in which, reflecting the fact that accounts balance, each row sum is equal to the corresponding column sum." That matrix, with an equal number of rows and columns, is the SAM, in the

construction of which "it may be possible to adopt a hierarchical approach, first adjusting the entries in a summary set of national accounts and then adjusting subsets of estimates to these controlling totals." (Pyatt and Roe, 1977: xix, xxiii).

In turn, in the abstract to his article, "A SAM approach to modeling", Graham Pyatt says: "Given that there is an accounting system corresponding to every economic model, it is useful to make the accounts explicit in the form of a SAM. Such a matrix can be used as the framework for a consistent dataset and for the representation of theory in what is called its transaction form." In that transaction form (or TV (transaction value) form), the SAM can be seen ... "as a framework for theory" and its cells..."can be filled instead with algebraic expressions, which describe in conceptual terms how the corresponding transaction values might be determined". Thus, the SAM is used as "the basic framework for model presentation." (Pyatt, 1988: 327; 337).

Looking at the question from the perspectives outlined above, it can be said that a SAM can have two versions: a numerical version, which describes the activity of a society empirically; and an algebraic version, which describes that same activity theoretically. In the former version, each cell has a specific numerical value, with the sums of the rows being equal to the sums of the columns. In the latter version, each cell is filled with algebraic expressions that, together with those of all the other cells, form a SAM-based model, the calibration of which involves a replication of the numerical version.

In the words of Graham Pyatt, "the essence of (...) the SAM approach to modelling is to use the same SAM framework for both the empirical and the theoretical description of an economy." (Pyatt, 1988: 337).

Therefore, supported by the words of Richard Stone quoted above, the national accounts and their underlying system will be adopted, consequently determining the SAM design and guaranteeing the credibility of the available data.

In 1953, with the first and most fundamental contribution written by that same author, the United Nations implemented the System of National Accounts (SNA), which continued to be published in successive versions until 2008 (ISWGA, 2008). This system establishes the rules for measuring the activity of countries or groups of countries, which, in turn, have been adopted and adapted to specific realities by the corresponding statistical offices.

The construction of algebraic versions can be seen, among others, in: Pyatt (2001; 1988), Pyatt and Roe, (1977), Pyatt and Round (1985), Santos (2010; 2009).

The construction of numerical versions of SAMs from the SNA will be examined below.

3. Constructing numerical versions of SAMs from the SNA. An application to Portugal.

The latest versions of the SNA have devoted a number of paragraphs to discussing the question of SAMs. The 2008 version mentions SAMs in Section D of Chapter 28, entitled "Input-output and other matrix-based analysis" (ISWGA, 2008: 519-522), in which a matrix representation is presented of the accounts identified and described in the whole SNA. This representation is not to be identified with the SAM presented in this paper, although they both cover all the transactions recorded by those accounts. The SAM that will be presented below results from the work that the author has undertaken within a conceptual framework based on the works of Graham Pyatt and his associates (Pyatt, 1988 and 1991; Pyatt and Roe, 1977; Pyatt and Round, 1985) and from the efforts made to reconcile that framework with what has been defined by (the successive versions of) the SNA (Pyatt, 1985 and 1991a; Round, 2003).

Working within the framework of the European System of National and Regional Accounts in the European Community of 1995 (the adaptation for Europe of the 1993 version of the SNA), Santos (2007) makes an application to Portugal at an aggregate level, explaining the main differences between these two matrices. Pyatt (1999) and Round (2003) also approach this same issue. Because the general differences between the accounts identified and described in the 1993 and 2008 versions of the SNA are not significant, this analysis still remains valid. It is also valid for the application to Portugal in 2007, presented in the following subsections.

Thus, following on from what was said above, a square matrix will be worked upon, in which the sum of the rows is equal to the corresponding sum of the columns. As is conventionally accepted, resources, incomes, receipts or changes in liabilities and net worth will be represented in the entries made in the rows, while uses, outlays, expenditures or changes in assets will be represented in the entries made in the columns. Each transaction will therefore be recorded only once, in a cell of its own.

The starting point for the construction of a numerical SAM should be its design, i.e. the classification of its accounts, which will depend on the purposes for which it is to be used. By adopting the SNA as the underlying base source of information, a basic structure is proposed and the consistency of the whole system is proved. The flexibility of that basic structure will be shown, together with the possibilities that it presents for characterising any problem and for achieving the purposes of any study.

3.1. The SAM's basic structure and its consistency with the whole system

Adopting the working method recommended by Richard Stone in the second paragraph of Section 2 of this paper, the basic structure for the SAM presented here will be a summary set of the national accounts and the controlling totals for the other levels of disaggregation. Thus, besides a rest of the world account, the SAM will include both production and trade accounts and institutional accounts.

In keeping with what has been said above, the design of the SAM will, on the one hand, follow the conceptual framework of the works of Graham Pyatt and his associates and, on the other hand, will adhere to the conventions and nomenclature defined by the SNA.

Table 1 shows the above-mentioned basic structure, representing nominal transactions ("t") with which two indexes are associated. The location of these transactions in the matrix framework is described by those indexes, the first of which represents the row account and the second the column account. Each cell of this matrix will be converted into a submatrix, with the number of rows and columns corresponding to the level of disaggregation of the row and column accounts.

Table 1. The basic SAM

	p	*a*	f	dic	dik	dif	rw	total
p – products	$t_{p,p}$	$t_{p,a}$	0	$t_{p,dic}$	$t_{p,dik}$	0	$t_{p,rw}$	$t_{p.}$
a – activities	$t_{a,p}$	0	0	0	0	0	0	$t_{a.}$
f – factors	0	$t_{f,a}$	0	0	0	0	$t_{f,rw}$	$t_{f.}$
dic – (domestic) institutions' current account	$t_{dic,p}$	$t_{dic,a}$	$t_{dic,f}$	$t_{dic,dic}$	0	0	$t_{dic,rw}$	$t_{dic.}$
dik – (domestic) institutions' capital account	0	0	0	t_{dikdic}	$t_{dik,dik}$	$t_{dik,dif}$	$t_{dik,rw}$	$t_{dik.}$
dif – (domestic) institutions' financial account	0	0	0	0	0	$t_{dif,dif}$	$t_{dif,rw}$	$t_{dif.}$
rw – rest of the world	$t_{rw,p}$	$t_{rw,a}$	$t_{rw,f}$	$t_{rw,dic}$	$t_{rw,dik}$	$t_{rw,dif}$		$t_{rw.}$
total	$t_{.p}$	$t_{.a}$	$t_{.f}$	$t_{.dic}$	$t_{.dik}$	$t_{.dif}$	$t_{.rw}$	

Sources: Santos (2010).

Note: The first three accounts (p = products, *a* = activities and f = factors (of production)) are the production and trade accounts of the economy and the next three accounts (dic = current; dik = capital; dif = financial) are the accounts of the (domestic) institutions. The last account (rw = rest of the world) represents the "outside" part of the (domestic) economy.

Table 2 shows the transactions of the National Accounts recorded in the cells of the basic SAM, which will continue to be the same if some disaggregation, or even extension, is performed – thereby preserving the consistency of the whole system.

Table 2. The National Accounts transactions in the cells of the basic SAM

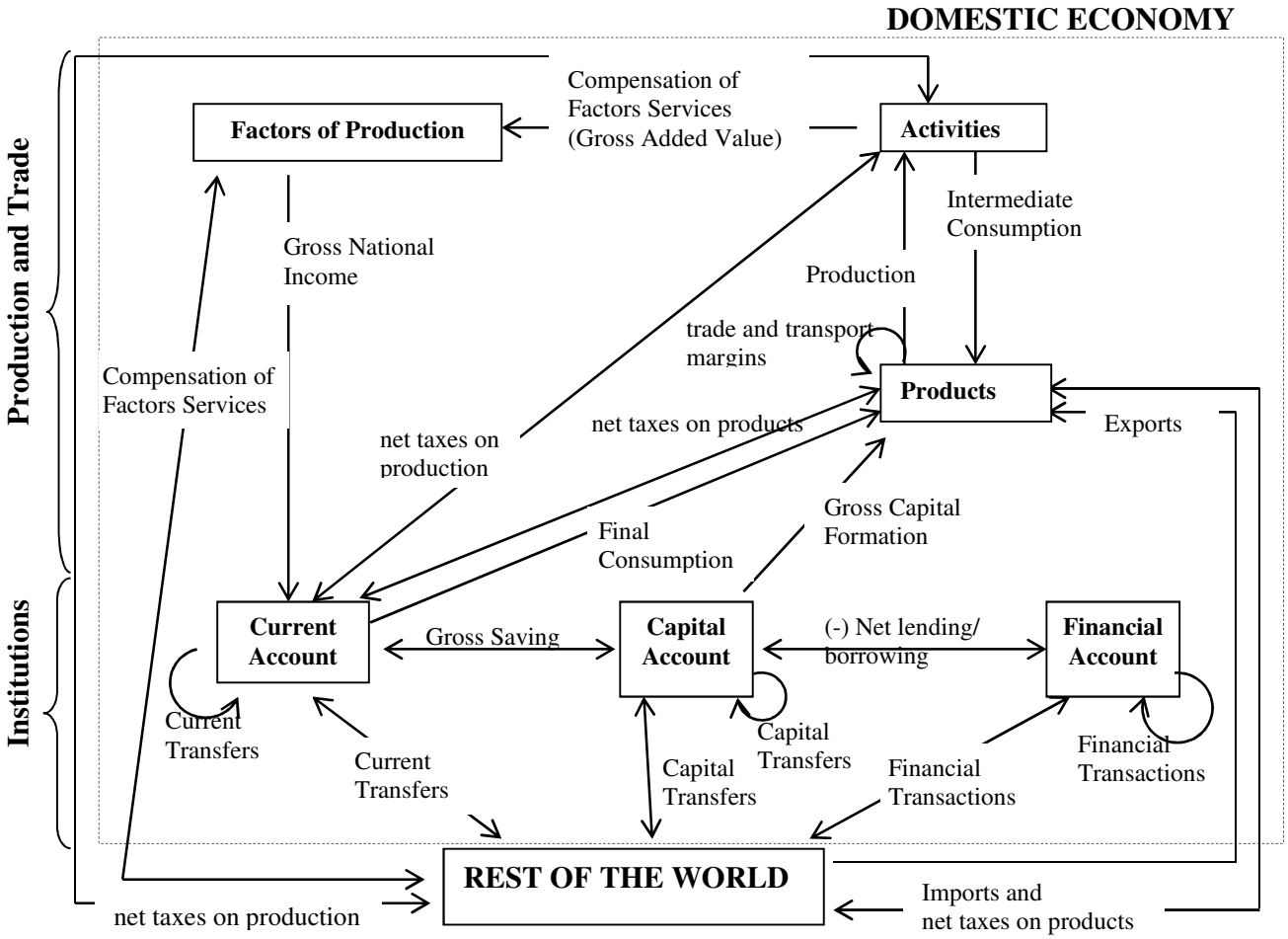
SAM			National Accounts transactions	
row	column	Description (valuation[1])	(SNA) code	Description (valuation[1])
p	p	trade and transport margins	---	trade and transport margins
a	p	production (basic prices)	P1	output (basic prices)
dic	p	net taxes on products (paid to domestic institutions – general government)	D21--D31	taxes on products *minus* subsidies on products
rw	p	net taxes on products (paid to the RW)		
		imports (cif prices)	P7	imports of goods and services (cif prices)
p	rw	exports (fob prices)	P6	exports of goods and services (fob prices)
p	*a*	intermediate consumption (purchasers' prices)	P2	intermediate consumption (purchasers' prices)
p	dic	final consumption (purchasers' prices)	P3	final consumption expenditure (purchasers' prices)
p	dik	gross capital formation (purchasers' prices)	P5	gross capital formation (purchasers' prices)
f	*a*	gross added value (factor cost)	D1 D4 B2g B3g	compensation of employees net property income gross operating surplus gross mixed income
dic	*a*	net taxes on production (paid to domestic institutions - general government)	D29--D39	other taxes on production *minus* other subsidies on production
rw	*a*	net taxes on production (paid to the RW)		
dic	f	gross national income	B5g	gross national income
rw	f	compensation of factors to the RW	D1 D4	primary income paid to/received from the rest of the world compensation of employees net property income
f	rw	compensation of factors from the RW		
dic	dic	current transfers within domestic institutions	D5 D6 D7 D8	current taxes on income, wealth, etc. social contributions and benefits other current transfers adjustment for the change in the net equity of households in pension funds reserves
rw	dic	current transfers to the RW		
dic	rw	current transfers from the RW		
dik	dic	gross saving	B8g	gross saving
dik	dik	capital transfers within domestic	D9	capital transfers

SAM			National Accounts transactions	
row	column	Description (valuation[1])	(SNA) code	Description (valuation[1])
		institutions		
dik	rw	capital transfers from the RW		
rw	dik	capital transfers to the RW		
dik	dif	- net lending/borrowing (see k) in de description of the SAM blocks)	B9	net lending/borrowing
dif	dif	financial transactions within domestic institutions	F1	monetary gold and special drawing rights (SDRs)
rw	dif	financial transactions to the RW	F2	currency and deposits
dif	rw	financial transactions from the RW	F3	securities other than shares
			F4	loans
			F5	shares and other equity
			F6	insurance technical reserves
			F7	other accounts receivable/payable
p	total	aggregate demand	row sum of the p account's cells (see above)	
total	p	aggregate supply	column sum of the p account's cells (see above)	
a	total	production value	P1	output (basic prices)
total	*a*	total costs	column sum of the *a* account's cells (see above)	
f	total	aggregate factors income	row sum of the f account's cells (see above)	
total	f		column sum of the f account's cells (see above)	
dic	total	aggregate income	row sum of the dic account's cells (see above)	
total	dic		column sum of the dic account's cells (see above)	
dik	total	investment funds	row sum of the dik account's cells (see above)	
total	dik	aggregate investment	column sum of the dik account's cells (see above)	
dif	total	total financial transactions	row sum of the dif account's cells (see above)	
total	dif		column sum of the dif account's cells (see above)	
rw	total	transactions value to the rest of the world	row sum of the rw account's cells (see above)	
total	rw	transactions value from the rest of the world	column sum of the rw account's cells (see above)	

Source: Santos (2010).

Schematically, the flows between the described accounts represent the circular flows in the economy, which, using the SAM description, can be seen in Outline 1.

Outline 1: The nominal flows between the accounts of the basic SAM



Source: Santos (2009: 6)

The SAM blocks, identified in Table 3, are submatrices or sets of submatrices with common characteristics. The specification of these blocks will be made below and involves an identification of the transactions of the National Accounts.

Table 3. The basic SAM by blocks

	p	*a*	f	dic	dik	dif	rw
p – products	TTM ($t_{p,p}$)	IC ($t_{p,a}$)	0	FC ($t_{p,dic}$)	GCF ($t_{p,dik}$)	0	EX ($t_{p,rw}$)
a – activities	P ($t_{a,p}$)	0	0	0	0	0	0
f – factors	0	CFP_GAV ($t_{f,a}$)	0	0	0	0	CFP ($t_{f,rw}$)
dic – (domestic) institutions' current account	NTP ($t_{dic,p}$)	NTA ($t_{dic,a}$)	CFP_GNI ($t_{dic,f}$)	CT ($t_{dic,dic}$)	0	0	CT ($t_{dic,rw}$)
dik – (domestic) institutions' capital account	0	0	0	S ($t_{dik,dic}$)	KT ($t_{dik,dik}$)	NLB ($t_{dik,dif}$)	KT ($t_{dik,rw}$)
dif – (domestic) institutions' financial account	0	0	0	0	0	FT ($t_{dif,dif}$)	FT ($t_{dif,rw}$)
rw – rest of the world	IM&NTP ($t_{rw,p}$)	NTA ($t_{rw,a}$)	CFP ($t_{rw,f}$)	CT ($t_{rw,dic}$)	KT ($t_{rw,dik}$)	FT ($t_{rw,dif}$)	0

Source: Santos (2009; 2010)

Description:

a) Production – P (cell: $t_{a,p}$) represents the output of goods and services (transaction P1 of the National Accounts).

b) Domestic Trade is represented by the value of domestically transacted products, which can be either domestically produced or imported.

   b.1) Intermediate Consumption – IC (cell: $t_{p,a}$) consists of the value of the goods and services consumed as inputs through a process of production, excluding those fixed assets whose consumption is recorded as consumption of fixed capital (transaction P2 of the National Accounts).

   b.2) Final Consumption – FC (cell: $t_{p,dic}$) consists of the expenditure incurred by resident institutional units on those goods or services that are used for the direct satisfaction of individual needs or wants, or the collective needs of members of the community (transaction P3 of the National Accounts).

   b.3) Gross Capital Formation – GCF (cell: $t_{p,dik}$) includes: gross fixed capital formation (transaction P51 of the National Accounts), changes in inventories (transaction P52), and acquisitions minus disposals of valuables (transaction P53).

c) External Trade – includes the transactions in goods and services from non-residents to residents, also known as imports (transaction P7 of the National Accounts), or IM (cell: $t_{rw,p}$), and the transactions in goods and services from residents to non-residents, also known as exports (transaction P6 of the National Accounts), or EX (cell: $t_{p,rw}$).

d) Trade and Transport Margins – TTM (cell: $t_{p,p}$) are realised on goods purchased for resale and are a part of the production of wholesale trade services, retail trade services and the repair services of motor vehicles, motorcycles and personal and household goods. They amount to zero, since they are negative in relation to the three above-mentioned activities (because the corresponding value has already been recorded in the production submatrix), but are positive and have the same amount in relation to all the other ones.

e) Net indirect taxes or net taxes on production and imports

e.1) Net Taxes on Production – NTA (cells: $t_{dic,a}$; $t_{rw,a}$) represents the (other) taxes on production (transaction D29 of the National Accounts) minus the (other) subsidies to production (transaction D39 of the National Accounts).

e.2) Net Taxes on Products – NTP (cells: $t_{dic,p}$; $t_{rw,p}$) represents the taxes on products (transaction D21 of the National Accounts) minus the subsidies on products (transaction D31 of the National Accounts).

f) Compensation of factors of production – CFP (cells: $t_{f,a}$; $t_{dic,f}$; $t_{f,rw}$; $t_{rw,f}$) consists of the income of the institutional sectors originating from the compensation of the services provided through their real and financial assets to the activities of production and to the rest of the world, namely compensation of employees (transaction D1 of the National Accounts) and compensation of own-account assets, including the compensation of employers and/or own-account workers, and of capital, namely property income (transaction D4, balances B2g and B3g of the National Accounts).

g) Current Transfers – CT (cells: $t_{dic,dic}$; $t_{dic,rw}$; $t_{rw,dic}$) includes: current taxes on income, wealth, etc. (transaction D5 of the National Accounts); social contributions (transaction D61); social benefits in cash (transaction D62); other current transfers (transaction D7); and the adjustment made for the change in the net equity of households in pension fund reserves (transaction D8).

h) Capital Transfers – KT (cells: $t_{dik,dik}$; $t_{dik,rw;}$ $t_{rw,dik}$) includes: capital taxes (transaction D91 of the National Accounts), investment grants (transaction D92); other capital transfers (transaction D99); and acquisitions less disposals of non-financial non-produced assets (transaction K2)

i) Financial Transactions – FT (cells: $t_{dif,dif}$; $t_{dif,rw}$; $t_{rw,dif}$) represents the transactions in financial assets and liabilities between institutional units, and between these and the rest of the world. They are classified as monetary gold and special drawing rights; currency and deposits;

securities other than shares; loans; shares and other equity; insurance technical reserves; and other accounts receivable/payable (F1-7 of the National Accounts).

j) Gross Saving – S (cell: $t_{dik,dic}$) measures the portion of aggregate income that is not used for final consumption expenditure and current transfers to domestic institutions or to the rest of the world.

k) Net borrowing/lending – NLB (cell: $t_{dik,dif}$).

The net lending (+) or borrowing (-) of the total economy is the sum of the net lending or borrowing of the institutional sectors. It represents the net resources that the total economy makes available to the rest of the world (if it is positive) or receives from the rest of the world (if it is negative). The net lending (+) or borrowing (-) of the total economy is equal (but with an opposite mathematical sign) to the net borrowing (-) or lending (+) of the rest of the world.

Here, those amounts that fall short of (+) or exceed (-) the investment funds used to cover aggregate investment are recorded in the capital and financial accounts, since they are financial transactions either from the rest of the world (in the case of net borrowing) or to the rest of the world (in the case of net lending). This is why the mathematical signs defined in the first paragraph of this item have been exchanged.

The construction of a SAM is easier when performed by blocks.

The integrated economic accounts table is equivalent to a summary of everything that is measured by the SNA. According to paragraph 2.75 of the 2008 SNA, "The integrated economic accounts use (…) three of the conceptual elements of the SNA (...) [institutional units and sectors, transactions and assets and liabilities] together with the concept of the rest of the world to form a wide range of accounts. These include the full sequence of accounts for institutional sectors, separately or collectively, the rest of the world and the total economy." (ISWGNA, 20008: 23). The table in the appendix illustrates this situation for Portugal in 2007. Based on that table, and in view of the previous description, it can be said that (practically) all the transactions recorded by the national accounts are considered in the cells of the SAM. Table 4 illustrates its application to Portugal in 2007.

Table 4. Basic SAM of Portugal in 2007 (un: 10^6 euros)

	p	*a*	f	dic	dik	dif	rw	total
p – products	0	171 360		141 615	38 634		54 514	406 123
a – activities	317 058							317 058
f – factors		146 564					13 056	159 620
dic – (domestic) institutions' current account	22 876	230	140 287	80 940			4 841	249 175
dik – (domestic) institutions' capital account				21 473	1 122	15 061	2 341	39 997
dif – (domestic) institutions' financial account						48 913	38 471	87 384
rw – rest of the world	66 188[(a)]	-1 096	19 333	5 147	241	23 410		113 223
total	406 123	317 058	159 620	249 175	39 997	87 384	113 223	

Source: Integrated Economic Accounts Table for Portugal in 2007 (Appendix).

Note: Since direct purchases abroad by residents (2 019 * 10^6 euros) are not expenditures within the domestic economy, they were considered as a current transfer to the rest of the world and were therefore deducted from the final consumption of the households and from imports.

[(a)] 66 188 = 66 026 (imports) + 163 (net taxes on products sent to the rest of the world)

Therefore, as mentioned above and again using the words of Richard Stone, the basic SAM that has just been described is the most aggregate "summary set of national accounts" and can represent a first level of the intended hierarchical method (approach), with all the controlling totals for the next level of that hierarchy.

3.2. Disaggregations and extensions

Some other levels of the above-mentioned hierarchical method can be identified within the national accounts, providing other controlling totals for greater levels of disaggregation – with or without the use of national accounts.

Thus, with the expected appearance of quarterly national accounts, although these will not be as complete as the annual ones, it will be possible to make some disaggregation in terms of time.

Furthermore, disaggregations can be made in terms of space, since regional accounts are also considered. Here, with the same SNA, it is possible to work with regions and countries, either individually or as a group. Round (1994; 1991), for example, experimented with the case of Europe. It would even be possible to think in world terms, if the SAM could be adopted worldwide.

Extensions are also possible, either from the national accounts or from other sources of information. The 2008 SNA dedicates its Chapter 28 to "Satellite accounts and other extensions" (ISWGNA, 20008: 523-544), where the main idea is to serve specific analytical purposes, in a way that is consistent with the central framework, although not fully integrated into it (ISWGNA, 2008: 37-38). In this respect, the author would like to support Steven Keunning and Willem Ruijter's idea of a "complete data set" which "could be tentatively labelled: a System of Socio-economic Accounts" (Keunning and Ruijter, 1988: 73).

3.2.1. Production and trade accounts

In the basic structure described above, the production and trade accounts are the accounts of products, activities and factors of production. These accounts correspond respectively to the SNA accounts of goods and services, production and the primary distribution of income. Thus, within these accounts and depending on the available level of disaggregation, it can be seen how the available products are used, with some details being provided about the process of production and about how the incomes resulting from that process and the ownership of assets are distributed among institutions and activities (Santos, 2007).

The SNA uses the Central Product Classification (CPC) Version 2 (completed in December 2008) to classify products (ISWGNA, 2008: 19), which are organised into 10 sections, with it being possible to go to the 5th level of disaggregation within each of these.
In turn, the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 4 (officially released in August 2008) is used to classify the activities (ISWGNA, 2008: 20), organised into 23 sections, the disaggregation of which is perfectly consonant with that of the product classification. The Supply and Use Table provides this information, usually at an intermediate level of disaggregation.

As described above, in the characterisation of the block representing the compensation of factors of production, the possible disaggregation from the tables of the national accounts is between labour (or the compensation of employees) and what the author called the compensation of own-account assets, which includes the compensation of employers and/or own-account workers, and the compensation of capital, namely property income. Such information can only be derived from the Integrated Economic Accounts Table if the products and activities accounts are not disaggregated or from the Supply and Use Table if those accounts are disaggregated. Table 5, which contains the above-mentioned application to Portugal, in which the products and activities accounts are not disaggregated, presents the possible disaggregation of the factors of production accounts based on the Integrated Economic Accounts Table (in Appendix).

The extensions for tourism and health are presented by the SNA as examples of satellite accounts (ISWGNA, 2008: 531-534; 538-542).

3.2.2. Institutions and Rest of the World accounts

In the basic structure described above, the accounts of the domestic institutions are divided into current, capital and financial accounts. These accounts correspond respectively to the following SNA accounts: secondary distribution of income, redistribution of income in kind and use of income; capital; and financial accounts. Within these accounts, depending on the available level of disaggregation, the current accounts show how the national income is transformed into disposable income through the receipt and payment of current transfers, and how the latter is distributed between final consumption and saving. In turn, the capital account records the transactions linked to acquisitions of non-financial assets and capital transfers involving the redistribution of wealth, whereas the financial account records the transactions in financial assets and liabilities between institutional units, and between these and the rest of the world (Santos, 2007).

All the linkages between the domestic economy and the rest of the world, i.e. all the transactions between resident and non-resident units, are recorded both in the SAM and in the SNA through the rest of the world account (Santos, 2007).

Chapter 4 of the 2008 SNA specifies the institutional sectors, including the rest of the world, and their possible disaggregation, which in some cases can be taken as far as the third level (ISWGNA, 2008: 61-85), although normally it cannot be taken beyond the first level. In the case of the rest of the world, such disaggregation will certainly depend on the country, or group of countries, that adopt and adapt this system.

At the first level of disaggregation, the accounts of the institutions, as well as the rest of the world account, are part of the Integrated Economic Accounts Table. Higher levels of disaggregation, whenever these are possible, are usually published in separate accounts.

Even at the first level of disaggregation, any work conducted with the institutional sectors requires, in addition to the Integrated Economic Accounts or the Accounts of the Institutions, the so-called "from whom to whom matrices", which are not normally published, but can be acquired from the national statistical offices. These matrices make it possible to fill in the cells of the submatrices of transactions taking place within domestic institutions, recorded in the above-described blocks of current and capital transfers and financial transactions.

As far as this aspect is concerned, the author would like to underline the importance of the information provided by the possible disaggregations of the financial account, especially in a SAM framework, in which interactions can be identified at many different levels. Regarding this issue, see Roe (2003).

The disaggregation of specific institutional sectors makes it possible to analyse the most diverse aspects of a society's activity: income distribution, with disaggregated households and factor of production accounts (Santos, 2009, is an example of this); the role of the government and its subsectors, with a disaggregated general government account (Santos, 2004 and 2007a, are other examples); the role of the non-profit institutions serving households, as well as of the non-financial and/or financial corporations, etc. The interaction between production and trade processes and income distribution can also be studied.

Table 5 presents the possible disaggregation of the institutions' current and capital accounts, made from the Integrated Economic Accounts Table and the "from whom to whom matrices", for Portugal in 2007. Due to the unavailability of "from whom to whom matrices" for financial transactions, the financial account could not be disaggregated.

Table 5. SAM of Portugal in 2007 (in millions of euros), with disaggregated factors of production and the (domestic) institutions' current and capital accounts (un: 10^6 euros)

Outlays (expenditures) / Incomes (receipts)			PRODUCTION					INSTITUTIONS												REST OF THE WORLD	TOTAL
					FACTORS			CURRENT ACCOUNT						CAPITAL ACCOUNT						FINANCIAL ACCOUNT	
			PRODUCTS	ACTIVITIES	Labour (employees)	Own Assests	Total	Households	Enterprises (nonfinancial corporations)	Financial corporations	Government	NonProfitInsti-tutionsServing Households (NPISH)	Total	Households	Enterprises (nonfinancial corporations)	Financial corporations	Government	NonProfitInsti-tutionsServing Households (NPISH)	Total			
			1	2	3	4		5	6	7	8	9		10	11	12	13	14		15	16	
PRODUCTION	PRODUCTS	1	0	171 360	0	0	0	105 201	0	0	32 999	3 415	141 615	9 287	23 003	1 683	4 113	547	38 634	0	54 514	406 123
	ACTIVITIES	2	317 058	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	317 058
	FACTORS: Labour (employees)	3	0	82 876	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	247	83 123
	FACTORS: Own Assets	4	0	63 688	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12 809	76 498
	FACTORS: Total		0	146 564	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13 056	159 620
INSTITUTIONS	CURRENT ACCOUNT: Households	5	0	0	82 871	34 809	117 680	792	1 715	5 093	25 060	64	32 725	0	0	0	0	0	0	0	4 162	154 567
	CURRENT ACCOUNT: Enterprises (nonfinancial corporations)	6	0	0	0	15 972	15 972	1 711	0	705	141	0	2 557	0	0	0	0	0	0	0	88	18 617
	CURRENT ACCOUNT: Financial corporations	7	0	0	0	5 918	5 918	5 143	627	133	24	29	5 957	0	0	0	0	0	0	0	73	11 948
	CURRENT ACCOUNT: Government	8	22 876	230	0	- 230	- 230	29 427	6 423	1 429	21	27	37 328	0	0	0	0	0	0	0	518	60 723
	CURRENT ACCOUNT: NonProfitInstitutionsServingHouseholds(NPISH)	9	0	0	0	946	946	521	149	44	1 660	0	2 374	0	0	0	0	0	0	0	0	3 320
	CURRENT ACCOUNT: Total		22 876	230	82 871	57 416	140 287	37 594	8 914	7 405	26 905	121	80 940	0	0	0	0	0	0	0	4 841	249 175
	CAPITAL ACCOUNT: Households	10	0	0	0	0	0	8 551	0	0	0	0	8 551	0	0	2	75	0	77	- 2 265	3 048	9 411
	CAPITAL ACCOUNT: Enterprises (nonfinancial corporations)	11	0	0	0	0	0	0	9 473	0	0	0	9 473	0	0	0	749	0	749	14 762	- 1 859	23 125
	CAPITAL ACCOUNT: Financial corporations	12	0	0	0	0	0	0	0	4 432	0	0	4 432	0	0	2	1	0	3	- 2 692	- 55	1 688
	CAPITAL ACCOUNT: Government	13	0	0	0	0	0	0	0	0	- 767	0	- 767	11	22	0	0	1	34	4 777	1 181	5 225
	CAPITAL ACCOUNT: NonProfitInstitutionsServingHouseholds(NPISH)	14	0	0	0	0	0	0	0	0	0	- 216	- 216	0	0	0	259	0	259	479	26	549
	CAPITAL ACCOUNT: Total		0	0	0	0	0	8 551	9 473	4 432	- 767	- 216	21 473	11	22	4	1 084	1	1 122	15 061	2 341	39 997
	FINANCIAL ACCOUNT	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48 913	38 471	87 384
REST OF THE WORLD		16	66 188	- 1 096	252	19 081	19 333	3 221	230	111	1 586	0	5 147	113	100	0	28	0	241	23 410	X	113 223
TOTAL			406 123	317 058	83 123	76 498	159 620	154 567	18 617	11 948	60 723	3 320	249 175	9 411	23 125	1 688	5 225	549	39 997	87 384	113 223	X

Sources: Statistics Portugal (*INE*); Portuguese Central Bank (*Banco de Portugal*)
(Integrated Economic Accounts Table (in Appendix); "from whom to whom matrices" for transactions D39 and D5-9 – see Table 2).

3.3. Aggregates, indicators and balances

As was seen above, all the transactions of the national accounts are covered by the SAM, so that macroeconomic aggregates, indicators and balances can be identified from it (see the description of the cells or blocks in Tables 1 or 3).

Gross Domestic Product at market prices (GDP_{pm}), which is usually considered the main macroeconomic aggregate, can be calculated in the three known approaches:

- Production approach: $GDP_{pm} = P - IC + NTP = t_{a,p} - t_{p,a} + (t_{dic,p} + \text{(part of) } t_{rw,p})$;
- Expenditure approach: $GDP_{pm} = FC + GCF + Ex - IM = t_{p,dic} + t_{p,dik} + t_{p,rw} - \text{(part of) } t_{rw,p}$;
- Income approach: $GDP_{pm} = GAV + NTP + NTA = t_{f,a} + (t_{dic,p} + \text{(part of) } t_{rw,p}) + (t_{dic,a} + t_{rw,a})$.

The Portuguese GDP_{pm} in 2007 was 168 737 * 10^6 euros, which can be calculated from these three approaches as follows:

- Production approach: GDP_{pm} = 317 058 – 171 360 + (22 876 + 163);
- Expenditure approach: GDP_{pm} = 141 615 + 38 634 + 54 514 – 66 026;
- Income approach: GDP_{pm} = 146 564 + (22 876 + 163) + (230 – 1096).

Domestic Product can be converted into National Product by adding the compensation of factors received from the rest of the world and deducting the compensation of factors and the net indirect taxes (on both products and production) sent to the rest of the world. Thus, from the described cells of the basic SAM, GDP_{pm} can be converted into Gross National Product at market prices (GNP_{pm}) or Gross National Income (GNI_{pm}), as follows: $GDP_{pm} + t_{f,rw} - t_{rw,f} - t_{rw,a} - \text{(part of) } t_{rw,p}$. On the other hand, as the SAM directly provides Gross National Income at factor cost, this can also be calculated just by adding the net indirect taxes (on both products and production) received by domestic institutions: $t_{dic,f} + t_{dic,p} + t_{dic,a}$. The corresponding amount for Portugal in 2007 is 163 394 * 10^6 euros, for which the underlying calculations are as follows: GNP_{pm}= 168 737 + 13 056 – (19 333 – 1096 + 163); GNI_{pm}= 140 287 + 22 876 + 230.

In turn, Gross aggregates can be converted into Net aggregates (and balances) by deducting the consumption of the fixed capital (transaction K1 of the National Accounts, which lies outside the basic SAM, as will be seen in Section 3.4, but is part of the Integrated Economic Accounts)

Disposable Income (Domestic or National; Gross or Net) is also very important and can be calculated by adding to GNI_{pm} the net current transfers received by domestic institutions: GNI_{pm} + ((received)$t_{dic,dic}$+ $t_{dic,rw}$) – ((paid) $t_{dic,dic}$+ $t_{rw,dic}$). In our application: 163 394 + (80 940 + 4 841) – (80 940 + 3 128[2]) = 165 107 * 10^6 euros.

Gross Saving (S) and Net Lending or Borrowing (NLB) are given directly by the SAM, through $t_{dik,dic}$ and $t_{dik,dif}$, respectively, which in the case of Portugal in 2007 are: 21 473 and 15 061 * 10^6 euros. As explained in Subsection 3.1- k), the last amount represents net borrowing.

The application for Portugal of all the described aggregates can be checked in the Integrated Economic Accounts Table, in the Appendix.

It is also possible to calculate structural indicators of the functional and institutional distribution of generated income, as well as indicators of the use of disposable income.

In the functional distribution of generated income, the distribution of gross added value (at factor cost, GAV) among factors of production is given by the structure of the submatrix in the cell ($t_{f,a}$) of the basic structure, with its level of detail depending on the disaggregation of the activities (column account) and of the factors of production (row account). Table 6 shows the results for the application to Portugal.

Table 6. Portuguese functional distribution of the income generated in 2007
(in percentage terms)

	%
Factors of Production (generated income = gross added value, at factor cost)	
Labour (employees)	56.5
Own assets (employers and/or own-account workers; capital)	43.5
Total	100.0

Source: Table 5.

In the institutional distribution of generated income, the distribution of gross national income (at factor cost, GNI) is given by the structure of the submatrix in the cell ($t_{dic,f}$) of the basic structure. In this case, the level of detail will depend on the disaggregation of the factors of production (column account) and of the current account of the domestic institutions (row account). Table 7 shows the results of our application.

Table 7. Portuguese institutional distribution of the income generated in 2007 (in percentage terms)

	Factors of Production		
	Labour (employees)	Own assets (employers and/or own-account workers; capital)	Total
Institutions (generated income = gross national income)			
Households	100.0	60.6	83.9
Non-financial corporations		27.8	11.4
Financial corporations		10.3	4.2
General government		- 0.4	- 0.2
Non-profit institutions serving households		1.6	0.7
Total	100.0	100.0	100.0

Source: Table 5.

As described above for the whole economy, the disposable income of the institutional sectors can be calculated in the same way, and then its distribution and use can also be studied – see Table 8.

Table 8. Portuguese distribution and use of disposable income among institutions in 2007 (in percentage terms).

	Distribution of Disposable Income	Use of Disposable Income	
		Final Consumption(*)	Saving
Households	70.1	92.6	7.4
Non-financial corporations	5.7	---	100.0
Financial corporations	2.7	---	100.0
General government	19.5	102.4	- 2.4
Non-profit institutions serving households	1.9	106.7	- 6.7
Total	100.0	87.0	13.0

Source: Table 5.

(*) The expenditure (transaction P3 of the national accounts) and not the "actual" final consumption (transaction P4 of the national accounts), i.e. the amount really spent by each institution, although a part of the final consumption of the general government and all that of the NPISH will take the form of social transfers in kind (transaction D63 of the national accounts) and will include the "actual" final consumption of households.

Some additional data can allow for the study of additional details, for instance *per capita* indicators with demographic information.

The main items in the balance sheets of the institutional sectors and of the rest of the world can be calculated from the respective rows and columns of the SAM. The former will be referred to as

institutional balances and the latter as the balance of payments. The former will be referred to as institutional balances and the latter as the balance of payments. In the former, the total balance is the net lending/borrowing (NLB) of the respective institution, with an opposite mathematical sign to the one registered in the SAM; the current balance is the respective gross saving (S); and the capital balance is the difference between the first and the second. Tables 9 and 10 respectively, illustrate the institutional balances of the non-financial and financial corporations and the balance of payments for Portugal in 2007.

Table 9. Institutional balances of Portuguese Non-Financial and Financial Corporations in 2007 (un: 10^6 euros)

	Resources or Receipts (SAM rows)			Uses or Expenditure (SAM columns)			Balance	
		Non-Financial Corporations	Financial Corporations		Non-Financial Corporations	Financial Corporations	Non-Financial Corporations	Financial Corporations
1. Current Account (a)		18 617	11 948		9 144	7 516	9 473	4 432
	Gross National Income at factor cost	15 972	5 918	Final Consumption	0	0		
	Net taxes on production	0	0	Current transfers to domestic institutions	8 914	7 405		
	Net taxes on products	0	0	Current transfers to the RW	230	111		
	Current transfers from domestic institutions	2 557	5 957					
	Current transfers from the RW	88	73					
2. Capital Account		- 1 110	- 52		23 125	1 688	- 24 235	- 1 739
	Capital transfers from domestic institutions	7 49	3	Gross Capital Formation	23 003	1 683		
	Capital transfers from the RW	- 1 859	- 55	Capital transfers to domestic institutions	22	4		
				Capital transfers to the RW	100	0		
3 = 1 + 2 (b)		17 507	11 896		32 269	9 204	- 14 762	2 692

Source: Table 5 (rows/columns 6, 7, 11 and 12)

(a) Balance = Gross saving
(b) Balance = - Net lending (+)/borrowing (-)

Table 10. Balance of Payments of Portugal in 2007 (un: 10^6 euros)

	Resources (SAM row)		Uses (SAM column)		Balance
1. Current Account		72 411		89 573	-17 162
- Goods & Services	Exports	54 514	Imports	68 045	-13 531
- Income	Compensation of factors from the RW	13 056	Compensation of factors to the RW	19 333	-6 277
- Current Transfers	Current transfers from the RW	4 841	Current transfers to the RW + net taxes on production to the RW + net taxes on production to the RW	2 195	2 646
2. Capital Account	Capital transfers from the RW	2 341	Capital transfers to the RW	241	2 101
3 = 1 + 2 (Balance = Net borrowing)		74 752		89 813	- 15 061
4. Financial Account	Financial transfers from the RW	38 471	Financial transfers to the RW	23 410	15 061
5 = 3 + 4 = Total		113 223		113 223	0

Source: Table 5 (row/column 16)

3.4. Examples of policy-type questions that can be addressed using a SAM

From what was seen above, by covering all the representative flows of the measured part of a society's activity, the SAM can be used to support the policy decision process in several ways, given the flexibility of the described basic structure and the possibilities of specification of various aspects of the underlying systems.

For example, under the scope of the social policy measures, we may want to work with specific flows in which government and households intervene directly, namely the current transfers between them both. Let us consider the case of the direct taxes on income, paid by the households to the government, and the case of the social benefits, paid by the government to the households. The identification of the absolute and relative importance of these flows in the corresponding institutional balances may be a first step. Tables 11 and 12 show the application to Portugal. On the other hand, comparisons with macroeconomic aggregates and some SAM values can complement that knowledge. For instance, in our application, the current taxes on income and wealth, etc., paid by households to the government represent 6.3% of the aggregate income of the former (the row/column total of its current account); or, alternatively, the benefits other than social transfers in kind, paid by the government to the households represent 21.1% of the households' disposable income.

From here, scenarios can be studied by using SAM-based model(s). The distributional effects of social policy measures directed to specific flows (for example, the direct taxes on income or the social benefits) can be studied not only at the level of the institutional sectors involved, but also at the level of the part of the society's activity quantified by the SAM (Santos, 2010, performs related experiments).

Table 11. Institutional Balance of Portuguese Government in 2007 and the relative importance of the current taxes on income, wealth, etc., (transactions D5) received from households and of the social benefits other than social transfers in kind (transaction D62) paid to the households.

	Resources or Receipts (SAM row)			Uses or Expenditure (SAM column)			Balance
		10^6 euros	Relative importance of D5 in.. (%)		10^6 euros	Relative importance of D62 in.. (%)	10^6 euros
1. Current Account (a)		60 723	16.0		61 490	39.8	- 767
	Gross National Income at factor cost	- 230		Final Consumption	32 999		
	Net taxes on production	230		Current transfers to domestic institutions - D62 paid to the households	26 905 24 469	90.9	
	Net taxes on products	22 876		Current transfers to the RW	1 586		
	Current transfers from domestic institutions - D5 received from the households	37 328 9 689	26.0				
	Current transfers from the RW	518					
2. Capital Account		1 215			5 225		- 4 010
	Capital transfers from domestic institutions	34		Gross Capital Formation	4 113		
	Capital transfers from the RW	1 181		Capital transfers to domestic institutions	1 084		
				Capital transfers to the RW	28		
3 = 1 + 2 (b)		61 938	15.6		66 715	36.7	- 4 777

Source: Table 5 (rows/columns 8 and 13) and "from whom to whom matrices"- Statistics Portugal (*INE*)

(a) Balance = Gross saving
(b) Balance = - Net lending (+)/borrowing (-)

Table 12. Institutional Balance of Portuguese Households in 2007 and the relative importance of the current taxes on income, wealth, etc., (transactions D5) paid to the government and of the social benefits other than social transfers in kind (transaction D62) received from the government.

	Resources or Receipts (SAM row)			Uses or Expenditure (SAM column)			Balance
		10^6 euros	Relative importance of D62 in.. (%)		10^6 euros	Relative importance of D5 in.. (%)	10^6 euros
1. Current Account (a)		154 567	15.8		146 015	6.6	8 551
	Gross National Income at factor cost	117 680		Final Consumption	105 201		
	Current transfers from domestic institutions - D62 received from the government	32 725 24 469	74.8	Current transfers to domestic institutions - D5 paid to the government	37 594 9 689	25.8	
	Current transfers from the RW	4 162		Current transfers to the RW	3 221		
2. Capital Account		3 125			9 411		- 6 286
	Capital transfers from domestic institutions	77		Gross Capital Formation	9 287		
	Capital transfers from the RW	3 048		Capital transfers to domestic institutions	11		
				Capital transfers to the RW	113		
3 = 1 + 2 (b)		157 691	15.5		155 426	6.2	2 265

Source: Table 5 (rows/columns 5, and 10) and "from whom to whom matrices"- Statistics Portugal (*INE*)

(a) Balance = Gross saving
(b) Balance = - Net lending (+)/borrowing (-)

4. Going beyond the basic structure

In order to improve the snapshot given by the SAM, as described above, some rearrangements could be made to the described cell contents and/or some zero cells could be filled in. This can be done either within and/or outside the scope of the SNA

a) Within the scope of the SNA, the following topics are examples of rearrangements that could be made to the described cells' contents (the described cells can be identified in Tables 1 or 3), in order to avoid the existence of negative cells in the SAM. This would help to improve its definition (incomings in rows and outgoings in columns) and facilitate the application of certain balancing methods, whenever necessary.

   a.1) Instead of working with net indirect taxes, it is possible to work with taxes and subsidies separately. The taxes on products and on production could be recorded in the above-described NTP ($t_{dic,p}$; $t_{rw,p}$) and NTA ($t_{dic,a}$; $t_{rw,a}$) blocks, respectively. The subsidies on products could be recorded in cells $t_{p,dic}$ and $t_{p,rw}$. The subsidies on production would then be recorded in cells $t_{a,dic}$ and $t_{a,rw}$.

   a.2) The net lending or borrowing (NLB), which, in the SAM's capital account, is considered as a component of investment funds, not required or required to cover aggregate investment, could be recorded in cells $t_{dik,dif}$, in the case of net borrowing, and in cells $t_{dif,dik}$, in the case of net lending. Thus, if there is net borrowing, we have a financing requirement that is covered by financial transactions (from the rest of the world, since the national funds are not sufficient), i.e. a resource of the capital account (row) and a use of the financial account (column). If there is net lending, we have a financing capacity that will be absorbed by financial transactions (to the rest of the world, since the national funds are in excess), i.e. a resource of the financial account (row) and a use of the capital account (column).

b) Still working within the scope of the SNA, some new data could be considered, either in addition to other data or as possible replacements for these figures.

   b.1) The consumption of fixed capital could be included in $t_{p,dik}$.

   b.2) The production of the institutional sectors could be included in $t_{dic,p}$. In the basic structure, production is recorded in cells $t_{a,p}$.

   b.3) The intermediate consumption of the institutional sectors could be included in $t_{p,dic}$. In the basic structure, intermediate consumption is recorded in cells $t_{p,a}$.

c) Outside the scope of the SNA, working either within or outside the framework of the satellite accounts, the inclusion of the following aspects could be considered[3].

   c.1) The expansion of the production boundary, for example recording the services that households deliver to themselves. The extension to unpaid household activity is

presented by the SNA as an example of satellite accounts (ISWGNA, 2008: 542-543). In this case a possible income in kind could be analysed.

c.2) The consideration of informal aspects of the economy, to which SNA dedicates the Chapter 25 (ISWGNA, 2008: 471-482).

c.3) The (re)analysis of the imputations; the underlying methodologies and possible adjustment.

c.4) Demography and the activity of the population of working age, their time use, skills, etc.

c.5) The rethinking of the way in which the factors of production are worked upon and the possible consideration of natural resources and their relationship with the society's activity. The extension to environmental accounting is presented by the SNA as an example of satellite accounts (ISWGNA, 2008: 534-538).

c.6) Stocks of capital and wealth.

The author knows that the implementation and study of some of these topics, especially those referred to in subsection c), could become valuable research projects, and that, in fact, some of them are already part of the SNA's research agenda. However, the aim here is to show that, although the SAM (especially when based on the SNA) is a very complete and credible measurement tool, there is still much that can be done to improve it.

5. Concluding remarks

Together, the United Nations System of National Accounts (SNA) is flexible enough and the Social Accounting Matrix (SAM)-based approach versatile enough to measure the society's activity with full validity. From that measurement, underlying systems can be identified and worked upon in order to support the policy decision process.

It is proposed that the work on the sectors of production should be undertaken in conjunction with the institutional sectors, using the national accounts as the base source of information. This proposal is based on the particular type of advantage of the SAM represented by " the emphasis on consistency and the importance of complete articulation, both of which are the essence in trying to understand feedback systems, in general, and the interdependence of the distribution of income and the structure of production, in particular", identified by Pyatt (1999: 385).

A SAM-based approach incorporates two versions of the SAM. A numerical version describes the activity of a society empirically, in which each cell has a specific numerical value, with the sums of the rows being equal to the sums of the columns. In turn, an algebraic

version describes that same activity theoretically. Each cell of the latter version contains algebraic expressions that, together with those of all the other cells, make up a SAM-based model, the calibration of which involves a replication of the numerical version. References for the latter were given and the construction of the former from the SNA was proposed. From that proposal the following possibilities were highlighted:

- Multi-period and dynamic analysis, since national accounts are published regularly.
- Identification of the network of nominal links existing within the (socio-)economic system, allowing for the particularisation of regions, products (goods and services), activities (industries), institutions or sets of institutions (households, enterprises, government), etc.
- Study of the processes of production and trade, as well as, the distribution, redistribution and accumulation of income.
- Evaluation of the impacts of alternative policy measures and the consequent policy decision, i.e. the processes of decision-making and decision-taking.
- Better use of the quantitative information available, since the SNA has developed national accounts that are increasingly consistent and in harmony with all other statistics.

However, both within and outside the scope of the SNA, there are several important aspects that still need to be completed. Some rearrangements can be made to the described cell contents and/or some zero cells can be filled in. Coverage of those aspects would improve the numerical version of the SAM proposed in this paper and the possible algebraic versions derived from it.

By using a SAM-based approach, with a consistent and credible numerical version, as proposed, and a corresponding well-defined algebraic version of a SAM, it will be possible to cover important aspects of a society's activity and improve the knowledge of the underlying systems. A SAM that is suitably designed to address a specific problem or set of problems can result in a fully interlinked macro-model, which can play an invaluable role, for example, in providing quantitative support in the policy decision process.

References

Inter-Secretariat Working Group on National Accounts – ISWGNA (2008) System of National Accounts (2008 SNA) United Nations Statistics Division and the United Nations regional commissions, New York; International Monetary Fund – IMF, Washington, DC; World Bank, Washington, DC; Organisation for Economic Cooperation and Development – OECD, Paris; Statistical Office of the European Communities - Eurostat, Brussels/Luxembourg.

Keuning S. and Ruijter W. (1988) Guidelines to the construction of a Social Accounting Matrix. *Review of Income and Wealth*, 34, 71-100.

Pyatt, G. (2001) Some Early Multiplier Models of the Relationship between Income Distribution and Production Structure. *Economic Systems Research*, 13, 139-163.

Pyatt, G. (1999) Some Relationships between T-Accounts, Input-Output Tables and Social Accounting Matrices. *Economic Systems Research*, 11, 365-387.

Pyatt, G. (1991) Fundamentals of Social Accounting. *Economic Systems Research*, 3, 315-341.

Pyatt, G. (1991a) SAMs, the SNA and National Accounting Capabilities. *Review of Income and Wealth*, 37, 177-198.

Pyatt, G. (1985) Commodity Balances and National Accounts: a SAM Perspective. *Review of Income and Wealth*, 31, 155-169.

Pyatt, G. (1988) A SAM Approach to Modeling. *Journal of Policy Modeling,* 10, 327-352.

Pyatt, G. and Roe, A. (1977) Social Accounting for Development Planning with Special Reference to Sri Lanka. (Cambridge-UK, Cambridge University Press).

Pyatt, G. and Round, J. (1985) Accounting and Fixed Price Multipliers in a Social Accounting Matrix Framework. In: G. Pyatt, and J. Round, (coord.), *Social Accounting Matrices. A Basis for Planning*. A World Bank Symposium, World Bank, 52-69; also in *Economic Journal*, 89 (356), 1979, 850-873.

Roe. A. (2003) Asymmetries between Rich and Poor Countries in Financial Crisis Responses: the Need for Flow-of-Funds Approach. *Economic Systems Research*, 15, 233-257.

Round, J. (2003) Constructing SAMs for Development Policy Analysis: Lessons Learned and Challenges Ahead. *Economic Systems Research*, 15, 161-183.

Round, J. (1994) The Structure of the European Economy: a SAM Perspective. In: J. Round, (ed.), *The European Economy in Perspective*. *Essays in Honour of Edward Nevin*. Cardiff, University of wales Press, 59-83.

Round, J. (1991) A SAM for Europe: Problems and Perspectives. *Economic Systems Research*, 3, 249-268.

Santos S. (2010) A quantitative approach to the effects of social policy measures. An application to Portugal, using Social Accounting Matrices. MPRA (Munich Personal

RePEc Archive) Paper No. 23676; EERI (Economics and Econometrics Research Institute) RP (Research Papers) 2010/33.

Santos S. (2009), From the System of National Accounts (SNA) to a Social Accounting Matrix (SAM)-Based Model. An Application to Portugal (Coimbra-Portugal, Edições Almedina)

Santos S. (2007) Macro-SAMs for Modelling Purposes. An Application to Portugal in 2003. Working Paper No. 17/2007/ Department of Economics/Research Unit on Complexity and Economics, ISEG-UTL.

Santos S. (2007a) Modelling Economic Circuit Flows in a Social Accounting Matrix Framework. An Application to Portugal. *Applied Economics*, 39, 1753-1771.

Santos S. (2004) Portuguese net borrowing and the government budget balance. A SAM approach. *Journal of Policy Modeling*, 26, 703-717.

Appendix: Integrated Economic Accounts Table for Portugal in 2007 (un: 10^6 euros)

Current accounts

Uses

Accounts	Total	Goods and Services Account (Resources)	S.2 Rest of the World Account	S.1 Total of the Economy	S.15 NPISHs	S.14 Households	S.13 General Government	S.12 Financial Corporations	S.11 Non-Financial Corporations	Code	Transactions and other flows, stocks and balancing items
I. Production / external account of goods and services	68 045	68 045								P.7	Imports of goods and services
	54 514		54 514							P.6	Exports of goods and services
	317 058	317 058								P.1	Output of goods and services
	171 360			171 360	2 238	12 667	7 048	5 207	144 201	P.2	Intermediate consumption
	23 039	23 039		23 039						D.21-D.31	Net taxes on products
	168 737			**168 737**	**2 677**	**29 383**	**23 131**	**10 978**	**79 528**	**B.1g/B.1*g**	**Gross added value/gross domestic product**
	28 351			28 351	551	8 576	3 257	673	15 293	K.1	Consumption of fixed capital
	140 386			**140 386**	**2 125**	**20 808**	**19 874**	**10 305**	**64 235**	**B.1n/B.1*n**	**Value added, net/Net domestic product**
	13 531		**13 531**							B.11	**External balance of goods and services**
II.1 Primary distribution of income accounts — II.1.1 Generation of income account	**83 123**		247	82 876	2 313	5 600	20 271	4 137	50 536	D.1	Compensation of employees
	24 982			**24 982**	4	635		30	632	D.2	Taxes on production and imports
	- 2 808			**- 2 808**	**- 184**	**- 750**	**- 341**	**- 3**	**- 909**	D3	Subsidies
	46 612			**46 612**	**544**	**6 822**	**3 281**	**6 815**	**29 229**	B.2g	Gross operating surplus
	17 076			**17 076**		**17 076**				B.3g	Gross mixed income
	28 618			**28 618**	**- 8**	**694**	**- 56**	**6 142**	**13 936**	B.2n	Net operating surplus
	14 719			**14 719**		**14 719**				B.3n	Net mixed income
II.1.2. Allocation of primary income account	**76 011**		12 809	63 201	165	8 101	4 621	26 645	23 469	D.4	Property income
	163 394			**163 394**	**946**	**117 680**	**22 877**	**5 919**	**15 972**	B.5g	**Gross national income/ Gross balance of primary incomes**
	135 043			**135 043**	**395**	**109 104**	**19 620**	**5 245**	**679**	B.5n	**Net national income/ Net balance of primary incomes**
II.2. Secondary distribution income account	16 112		21	16 092	6	9 717	21	1 399	4 949	D.5	Current taxes on income, wealth, etc
	25 264		71	25 193		25 193				D.61	Social contributions
	29 742		48	29 694	49	48	24 611	3 271	1 715	D.62	Social benefits other than social transfers in kind
	17 222		4 702	12 520	67	3 837	3 859	2 278	2 480	D.7	Other current transfers
	165 107			**165 107**	**3 199**	**115 202**	**32 232**	**5 000**	**9 473**	B.6g	**Gross disposable income**
	136 756			**136 756**	**2 648**	**106 627**	**28 975**	**4 327**	**- 5 821**	B.6n	**Net disposable income**
II.3. Redistribution of income in kind account	22 143			22 143	3 415		18 728			D.63	Social transfers in kind
	165 107			**165 107**	**- 216**	**137 345**	**13 504**	**5 000**	**9 473**	B.7g	**Gross adjusted disposable income**
	136 756			**136 756**	**- 767**	**128 769**	**10 247**	**4 327**	**- 5 821**	B.7n	**Net adjusted disposable income**
II.4. Use of income account	**165 107**			**165 107**	**3 199**	**115 202**	**32 232**	**5 000**	**9 473**	B.6g	**Gross disposable income**
	136 756			**136 756**	**2 648**	**106 627**	**28 975**	**4 327**	**- 5 821**	B.6n	**Net disposable income**
	143 634			143 634	3 415	107 220	32 999			P.4	Actual Final Consumption
	143 634			143 634		129 363	14 272			P.3	Final consumption expenditure
	569			569				569		D.8	Adjustment for the change in the net equity of households in pension funds reserves
	21 473			**21 473**	**- 216**	**8 551**	**- 767**	**4 432**	**9 473**	B.8g	**Gross saving**
	- 6 878			**- 6 878**	**- 767**	**- 25**	**- 4 824**	**3 759**	**- 5 821**	B.8n	**Net saving**
	17 162		**17 162**							B.12	**Current external balance**

Accumulation accounts

Changes in Assets

III.1. Capital accounts — III.1.1. Change in net worth due to saving and capital transfers account										B.8g	**Gross saving**
										B.8n	**Net saving**
										B.12	**Current external balance**
										D.9	**Capital transfers, receivable**
										D.9	Capital transfers, payable (-)
	10 283		**15 321**	**- 4 937**	**- 478**	**61**	**- 4 001**	**3 761**	**- 4 281**	B.10.1	**Changes in net worth due to saving and capital transfers**
III.1.2 Acquisitions of non-financial assets account	98 634			98 634	547	9 287	4 119	1 689	29 003	P.5	Gross capital formation
	- 28 351			- 28 351	- 551	- 8 576	- 3 257	- 673	- 15 293	K.1	Consumption of fixed capital (-)
			160	- 160	5	- 2 915	- 79	59	2 771	K.2	Acquisitions less disposals of non-produced non-financial assets
			15 061	**- 15 061**	**- 479**	**2 365**	**- 4 777**	**2 692**	**- 14 762**	B.9	**Net lending (+) /borrowing (-)**

			S.2	S.1	S.15 + S.14	S.13	S.12	S.11		
II.2 Financial account	112 826		39 471	74 359	15 972	- 698	45 712	13 352		Net acquisition of financial assets
										Net incurrence of liabilities
			1	- 1			- 1		F.1	Monetary gold and SDRs
	29 818		13 983	15 835	10 117	- 401	6 408	- 289	F.2	Currency and deposits
	28 663		17 792	10 871	1 821	- 76	9 147	- 21	F.3	Securities other than shares
	34 712		3 306	31 406	1 588	- 2 047	26 687	5 178	F.4	Loans
	5 406		2 677	2 729	- 1 576	1 502	2 776	27	F.5	Shares and other equity
	5 929		10	5 919	5 787	1	- 1	132	F.6	Insurance technical reserves
	8 296		702	7 594	- 1 765	339	701	8 325	F.7	Other accounts receivable/payable
									B.9 F	**Net lending (+) /borrowing (-)**

Appendix: Integrated Economic Accounts Table for Portugal in 2007 (un: 10^6 euros) (continued)

Current accounts

Resources

Code	Transactions and other flows, stocks and balancing items	S.11 Non-Financial Corporations	S.12 Financial Corporations	S.13 General Government	S.14 Households	S.15 NPISHs	S.1 Total of the Economy	S.2 Rest of the World Account	Goods and Services Account (Uses)	Total	Accounts
P.7	Imports of goods and services							68 045		68 045	I. Production / external account of goods and services
P.6	Exports of goods and services								54 514	54 514	
P.1	Output of goods and services	223 729	16 185	30 179	42 050	4 915	317 058			317 058	
P.2	Intermediate consumption								171 360	171 360	
D.21-D.31	Net taxes on products						23 039			23 039	
B.1g/B.1*g	**Gross added value/gross domestic product**	**79 528**	**10 978**	**23 131**	**29 383**	**2 677**	**168 737**			**168 737**	II.1 Primary distribution of income accounts
K.1	Consumption of fixed capital										II.1.1. Generation of income account
B.1n/B.1*n	**Value added, net/Net domestic product**	**64 235**	**10 305**	**19 874**	**20 808**	**2 125**	**140 386**			**140 386**	
B.11	**External balance of goods and services**							**13 531**		**13 531**	
D.1	Compensation of employees				82 871		82 871	252		83 123	II.1.2. Allocation of primary income account
D.2	Taxes on production and imports			24 527			24 527	454		24 982	
D3	Subsidies			- 1 421			- 1 421	- 1 388		- 2 808	
B.2g	**Gross operating surplus**	**29 229**	**6 815**	**3 201**	**6 822**	**544**	**46 612**			**46 612**	
B.3g	**Gross mixed income**				**17 076**		**17 076**			**17 076**	
B.2n	**Net operating surplus**	**13 936**	**6 142**	**- 56**	**604**	**- 8**	**20 618**			**28 618**	
B.3n	**Net mixed income**				**14 719**		**14 719**			**14 719**	
D.4	Property income	10 212	25 749	1 390	19 011	568	56 929	19 081		76 011	
B.5g	**Gross national income/ Gross balance of primary incomes**	**15 972**	**5 918**	**22 877**	**117 680**	**946**	**163 394**			**163 394**	II.2. Secondary distribution income account
B.5n	**Net national income/ Net balance of primary incomes**	**679**	**5 245**	**19 620**	**109 104**	**395**	**135 043**			**135 043**	
D.5	Current taxes on income, wealth, etc			16 084			16 084	28		16 112	
D.61	Social contributions	1 711	3 773	19 621	50	49	25 204	60		25 264	
D.62	Social benefits other than social transfers in kind				29 600		29 600	142		29 742	
D.7	Other current transfers	934	2 257	2 141	6 667	2 325	14 324	2 899		17 222	
B.6g	**Gross disposable income**	**9 473**	**5 000**	**32 232**	**115 202**	**3 199**	**165 107**			**165 107**	II.3. Redistribution of income in kind account
B.6n	**Net disposable income**	**- 5 821**	**4 327**	**28 975**	**106 627**	**2 648**	**136 756**			**136 756**	
D.63	Social transfers in kind				22 143		22 143			22 143	
B.7g	**Gross adjusted disposable income**	**9 473**	**5 080**	**13 504**	**137 345**	**- 216**	**165 107**			**165 107**	II.4. Use of income account
B.7n	**Net adjusted disposable income**	**- 5 821**	**4 327**	**10 247**	**128 769**	**- 767**	**136 756**			**136 756**	
B.6g	**Gross disposable income**	**9 473**	**5 000**	**32 232**	**115 202**	**3 199**	**165 107**			**165 107**	
B.6n	**Net disposable income**	**- 5 821**	**4 327**	**28 975**	**106 627**	**2 648**	**136 756**			**136 756**	
P.4	Actual Final Consumption								143 634	143 634	
P.3	Final consumption expenditure								143 634	143 634	
D.8	Adjustment for the change in the net equity of households in pension funds reserves				569		569			569	
B.8g	**Gross saving**										
B.8n	**Net saving**										
B.12	**Current external balance**										

Accumulation accounts

Changes in liabilities and net worth

B.8g	**Gross saving**	**9 473**	**4 432**	**- 767**	**8 551**	**- 216**	**21 473**			**21 473**	II.1.1 Capital Accounts: II.1.1. Change in net worth due to saving and capital transfers account
B.8n	**Net saving**	**- 5 821**	**3 759**	**- 4 024**	**- 35**	**- 767**	**- 6 878**			**- 6 878**	
B.12	**Current external balance**							**17 162**		**17 162**	
D.9	Capital transfers, receivable	1 661	7	1 135	209	290	3 303	241		3 544	
D.9	Capital transfers, payable (-)	- 122	- 4	- 1 112	- 124	- 1	- 1 362	- 2 181		- 3 544	
B.10.1	**Changes in net worth due to saving and capital transfers**	**- 4 281**	**3 761**	**- 4 001**	**61**	**- 478**	**- 4 937**	**15 231**		**10 293**	II.1.2 Acquisitions of non-financial assets account
P.5	Gross capital formation								38 634	38 634	
K.1	Consumption of fixed capital (-)										
K.2	Acquisitions less disposals of non-produced non-financial assets										
B.9	**Net lending (+) /borrowing (-)**										

		S.11	S.12	S.13	S.14 + S.15	S.1	S.2			II.2. Financial account
	Net acquisition of financial assets									
	Net incurrence of liabilities	25 278	43 609	3 636	14 861	87 384	25 440		112 824	
F.1	Monetary gold and SDRs									
F.2	Currency and deposits		19 770	928		20 698	9 120		29 818	
F.3	Securities other than shares	6 030	16 124	1 107	20	23 301	5 382		28 683	
F.4	Loans	16 097	477	979	12 090	29 643	5 068		34 711	
F.5	Shares and other equity	1 929	- 1 478			451	4 956		5 407	
F.6	Insurance technical reserves	431	5 499			5 930	- 1		5 929	
F.7	Other accounts receivable/payable	771	3 217	622	2 751	7 361	935		8 296	
B.9 F	**Net lending (+) /borrowing (-)**	**- 11 926**	**2 108**	**- 4 324**	**1 111**	**- 13 031**	**13 031**			
	Statistical discrepancy	2 836	- 584	453	- 675	2 030	- 2 030			

Sources: Statistics Portugal (*INE*); Portuguese Central Bank (*Banco de Portugal*)

[1] In the transactions represented by the cells whose rows and/or columns represent production accounts, as well as in the aggregates and balances that can be calculated from these, as will be seen in Section 3.3, the following types of valuation are identified (regardless of whether one is working with current or constant (price) values): factor cost; basic, cif (cost-insurance-freight included) and fob (free on board) prices; purchasers' or market prices.
Factor cost represents the compensation of the factors (or the primary incomes due to labour and capital) used in the production process of the domestic economy, excluding taxes on production and imports (taxes on products and other taxes on production) and subsidies (subsidies on products and other subsidies on production). This type of valuation is considered in the SNA (Paragraph 265) to be complementary (ISWGNA, 2008: 22).
When other taxes on production, net of other subsidies on production, are added to the production value of the domestic economy at factor cost, we obtain the basic prices for the production that will be transacted in the domestic market and the fob price level of the part that will be exported. Imports, valued at cif prices, will be added at this level to the unexported part of domestic production to be transacted in the domestic market.
Purchasers' or market prices relate to those products, either domestically produced or imported, that are transacted in the domestic market. Here, the basic/cif prices will be increased by adding to them the trade and transport margins and the taxes net of subsidies on products.

[2] In order to be completely consonant with the values of the national accounts, the direct purchases made abroad by the households are not considered here.

[3] Some of the aspects referred to in this paragraph were also referred to by Pyatt (1991a) when he argued in favour of a radical revision of the 1968 SNA, and by Round (2003) when he discussed the problematic compilation issues under the scope of the 1993 SNA.